

CHAPTER 9 ADDENDUM-THE PLAN FOR COMMERCIAL WIRELESS FACILITIES

■ GENERAL INFORMATION

Over the past decade, local governments and municipalities across the nation have been inundated with requests to construct new facilities, primarily in the form of tall towers, to support a growing market for wireless telecommunication applications. The group of wireless services being provided are termed Personal Communication Services (PCS) and commonly include phone, paging and wireless internet. These services play an important and vital role in many personal and business applications.

The Telecommunications Act of 1996 mandates that localities cannot prohibit development of towers and other equipment but provides a great deal of latitude in formulating plans and policies which address issues associated with their development. The challenge facing most localities is to develop a plan which complies with the requirements of the Telecommunications Act of 1996, while at the same time adequately addresses the issues and concerns of the citizenry. However, the current legislation affirms local governments' right to control siting, construction and the modification of cellular and other wireless telecommunications facilities.

This plan represents a comprehensive review and analysis of: the existing infrastructure, carrier needs, propagation, interference, topography, air navigation facilities, historic features, places, scenic roadways and, parks and recreational areas. Based upon this review, it is determined that the existing infrastructure is capable of meeting most of the future needs through a process termed co-location or the sharing of space on an existing structure. Through utilization of existing structures, the number of new towers needed would be reduced. In areas where structures do not currently exist, tower development would be permitted. However, any new development in these areas would have to conform to the applicable Zoning Ordinance sections governing tower siting.

The plan contained within this document enhances the current and future technological needs and maintains an aesthetically pleasing environment for the residents and visitors of Fauquier County by minimizing the visual and physical impact upon the landscape.

■ INTRODUCTION

The Goals, Objectives and Policies for Wireless Communications Technology are intended to provide a framework for evaluating telecommunications proposals under the County's development review process, as set forth in the Fauquier County Zoning Ordinance. The Goals for The Tower and Land Use Plan address industry needs relating to telecommunication infrastructure while minimizing impacts on adjacent and surrounding land uses, especially existing/planned residential communities and historical landmarks. The goals are also designed to support future county needs and public safety. Wireless communication

will provide a valued service to Fauquier residents but must be sensitive to the physical and visual impact on the landscape.

■ BACKGROUND

Proliferation of Tower Requests

Over the past decade, the convergence of several factors has resulted in the unprecedented growth in the number of wireless communications facilities.

1. The recent development of new devices and services for voice, data and multi-media communication have generated a demand for more and better wireless communications services.
2. In 1995 and 1996, the Federal Communication Commission auctioned licenses for unused portions of the available radio spectrum. This resulted in a host of new wireless communications service providers to immediately seek to develop a network of cell sites throughout the county, in a short time period.
3. Increased demand and competition among wireless communication service providers prompted them to seek additional facilities in order to expand the capacities of their systems and to upgrade to digital technology.
4. In 1996, Congress passed the Telecommunications Act, which further deregulated the telecommunications industry, and sought to promote competition. Although the Act preserved the authority of local governments to control land use and zoning, it forbade regulations that would prohibit or have the effect of prohibiting wireless services, unreasonably discriminate between providers or functionally equivalent services.
5. The original strategy of wireless providers was to provide coverage to a mobile market. Wireless service providers are now seeking to replace the conventional landline phone in residential developments, thus placing facilities in more densely populated areas than before. As towers and other structures are built near neighborhoods and other highly visible areas, communities have become more sensitive about their visual and physical impact.

At present, there are several companies that provide wireless telephone communications service in the Mobile Service Area (MSA) region. Industry sources indicate there are additional wireless telephone communications companies with franchise agreements for the Fredericksburg Broadcast Transmission Area (BTA) / Washington Mobile Transmission Area (MTA). There also are several companies in the region with franchises to provide Special Mobile Radio (SMR) service. In order to provide service within a region, a company needs to establish a network of antenna sites. New antennas may be co-located on

existing towers or other structures or may require the placement of new towers.

The County received seventeen new wireless service applications in 1999 for communication towers. Because of the existing providers in the area, there are possibilities for co-location on these existing towers. Space that may be available on existing towers often is not considered by other carriers interested in adding service to an area.

■ THE TECHNOLOGY OF WIRELESS SERVICES

Most personal wireless services operate in a similar technical fashion. A portable communication device receives from, and, in the case of a portable telephone, transmits radio signals to, an elected antenna or antenna set. The area covered by an antenna set is commonly referred to as a “cell.” The signal is routed to switching equipment that selects the channel and monitors the signal strength. In telephone applications, the signal normally is connected to the conventional or “land line” public telephone system or Loop Exchange Carrier (LEC). If the communication device is moving, the signal is passed on to an antenna in an adjoining cell and the call continues uninterrupted. Refer to [Figure 9.2](#) for the System Description; Exhibits A and B are included as appendices and provide useful glossary of terms.

For services which require more than one antenna to serve a large area, such as wireless telephone service, an effective system requires an engineered grid or network of antennas mounted on towers or other structures in a pattern somewhat resembling a honeycomb. Depending on the technology used, the height of the tower, the position of the antenna, topography, vegetation and other factors, the cell size can vary from less than a mile to several miles across. The wireless provider seeks to locate antennas spaced just far enough apart to provide the coverage needed. If the antennas are too close, the signal overlap can cause interference problems and the capacity of the system suffers. If the antennas are too far apart, gaps or holes are created in the coverage pattern which can result in calls being “dropped” as a traveler moves beyond the range of the antenna handling the call. Also, each cell can handle only a finite number of conversations at one time. As the signal traffic becomes too congested, additional cells are required to provide additional system capacity. The grid of cells just described constitutes the signal coverage pattern for a single PCS provider. Multiple providers are already operating or preparing to operate in the Fauquier County area with more expected in the next year.

■ CELL SITE OPPORTUNITY

The Telecommunications Act established a role for three parties in the future development of wireless communications services, the communications industry, the Federal Communication Commission (FCC) and local government. Within the confines of FCC licensing, administration and local government regulation of land use and zoning, each provider is free to design its own network or system. Wireless

communication services providers are not treated as public utilities or franchises but rather are competitors in an open market. Although the free market approach is intended to result in the best communications services for the least cost, it will also result in an increase in the number of wireless communications antennas and towers.

As each provider develops its own system independently, there is the potential for multiple antenna systems. To the extent that the antennas can be collocated on existing conforming structures, this is not a concern. However, where suitable structures do not currently exist, the deployment of these systems will involve requests for a very limited number of potential sites for wireless communications towers. This must be balanced with the interests of the public health, safety and welfare, community aesthetics and promoting the integrity of the County's residential neighborhoods, mountain resources, historic/archeological sites and rural areas. Therefore, providing an established county hierarchy in the type, scale and location of wireless communication facilities will assist in preserving the county's rural character, scenic values and residential neighborhoods, while still providing acceptable service.

Demand for wireless communication technology is increasing, while appropriate locations for such facilities are increasingly becoming more difficult to find. Telecommunication towers have special land use implications. The placement of towers impact-surrounding land uses and creates a visual impact on everyone who can see these facilities. With clear standards the wireless service providers will be able to select locations, which have the least impact, thereby increasing the likelihood of approval.

The following is a general category of sites that could be used for tower locations provided the location, siting and design standards of the Goals, Objectives, Policies, and Fauquier County Ordinance are met.

■ EXISTING COMMUNICATION TOWERS

Presently, over forty (40) structures capable of supporting antennas are in place throughout the county. Co-location opportunities exist on many of these sites.

■ VIRGINIA POWER

Virginia Power has several large electrical transmission corridors which cross the County in which tower mounts could be added to serve as telecommunications facilities. With existing power transmission towers, these corridors consist of easements and right-of-ways, which are over several miles in length. These corridors offer many opportunities for co-location of transmission towers and communications antennas. Virginia Power has worked closely with the telecommunications industry in facilitating co-location of transmission towers and communication antennas, as well as, co-location within its right-of-way.

■ BUILDINGS

Antennas may be mounted on the roofs or sides of buildings. While most buildings in the County are less than 35 feet tall, there are some structures that are taller and could be used for co-location opportunities provided that the antenna(e) are not visible from the road or are screened in with radio frequency transparent materials that camouflage the antennae.

■ CHURCHES

Many churches in the County present the wireless provider with the potential for locating antennae inside of existing steeples or of building a steeple for a church that does not presently have one. The church community may welcome these suggestions, as it provides a source of income for a non-profit organization.

■ PUBLIC SITES

The governmental sites within the County that may be appropriate for siting commercial wireless communications facilities include selected fire stations, libraries, landfills, post offices, water tanks and other public facilities. These facilities are often large enough to allow sufficient separation from surrounding residential uses or are located adjacent to industrial land use. Even on these sites, steps must be taken to minimize impacts on surrounding properties. These steps may include camouflaging such as attachments to the existing light poles or power mounts and the erection of silos where antennae are hidden in the top portion of the structure. The material which allows radio signals to penetrate through the structure is a Radio Frequency Transparent (RFT) fiberglass that can be molded in different textures and shapes.

■ PRIVATE LAND

Although the use of existing facilities is to be preferred to the construction of new ground-mounted facilities, there are opportunities for the development of freestanding mounts on private land. In particular, there are several acres of land zoned for industrial use that could be used for new tower locations.

■ PUBLIC SAFETY

It is within the purview of local government to regulate the manner in which structures are located and constructed in order to protect the safety of its citizens. As used in the Goals for Wireless Communication Technology, safety means physical hazards that can be measured and protected against. The following are safety issues related to wireless facilities.

■ RADIO FREQUENCY EMISSIONS

At high levels, certain kinds of radio frequency radiation (RFR) are known to be associated with certain environmental health risk factors. However, the power used by wireless technologies is relatively low and is not of the type normally associated with these health risks. The Telecommunications Act takes steps to remove radio frequency emissions as a basis for regulating or prohibiting wireless facilities, as long as specific standards are met.

■ THE ACT STATES

No State or local government or instrumentality thereof may regulate the placement, construction and modification of personal wireless service facilities on the basis of environmental effects of radio frequency emission to the extent that such facilities comply with the Commission's regulations concerning such emissions.

Because the FCC does not review each cell site, it is incumbent upon local government to assure that RF standards are being met. At a minimum, this should involve certification by the carrier and Communications Site manager that the proposed cell site meets the FCC regulations concerning radio frequency emissions, required signage and public notice.

■ STRUCTURAL HAZARDS

The structural hazards associated with wireless facilities include the potential collapse of the antenna mount and the potential of equipment or debris falling from the structure. Tower structures shall be constructed to BOCA National Building Code Standards and must withstand hurricane force winds up to 110 mph. Structures must also be designed to collapse into themselves if there is a failure. In response to potential hazards, some local governments designate a "fall zone" around the base of the antenna mount. These are generally expressed as distance-to-height ratios. The County of Fauquier's Zoning Regulations currently require fall zone setbacks. Refinement to these are included in the implementation recommendations section, and require a fall zone of 1 foot for each foot of tower height in all zoning district classifications. The basis for these setbacks is to prevent damage from ice or other falling debris from the antenna platform.

■ GOALS, OBJECTIVES AND POLICIES

The goals, objectives and policies of the Wireless Communications Technology Plan of the Comprehensive Plan are designed to seek a balance between providing wireless communication service to County residents and businesses while remaining sensitive to the location and appearance of these facilities.

Goals

1. To encourage managed development of wireless communications infrastructures, while at the

same time not unreasonably interfering with the development of the competitive communications marketplace.

2. To maintain and preserve the agricultural and residential character of the County and its neighborhoods and to promote the creation of an attractive and harmonious community.
3. To ensure that wireless communications towers and related wireless communications facilities are compatible and as visually unobtrusive as possible with surrounding land uses.
4. To establish a hierarchy in the type, location and procedures for personal wireless facilities, telecommunication towers and facilities.
5. To provide a uniform and comprehensive set of standards for the development and installation of wireless communications towers, antennas and related facilities.
6. To promote public safety and to avoid risk of damage to adjacent properties by ensuring that wireless communications towers and related wireless communications facilities are properly designed, constructed, modified and maintained.

Objectives

1. Minimize the adverse visual impacts of wireless communications towers and related facilities through careful design, siting, landscape screening and innovative camouflaging techniques.
2. The locations of personal wireless facilities and telecommunication towers, in excess of 80 feet, may be permissible only when it is technically justified due to unique environmental and terrain features and technological constraints, which preclude wireless communication service within the height standards.
3. Horizontally separate wireless communications towers from residential neighborhoods and other visually sensitive areas to the extent necessary to minimize visual obstruction.
4. Encourage the use of alternative support structures, co-location of new antennas on existing wireless communications towers, and camouflaged towers.
5. Ensure that co-location opportunities are fully met before permitting new wireless communications towers.
6. Ensure that the development of wireless facilities is done in a manner that meets all requirements and standards of the Federal Aviation Administration, the Federal Communications Commission, and the Uniform Statewide Building Code.

7. Ensure the timely removal of obsolete or abandoned equipment at no cost to County residents.
8. Ensure that telecommunication providers use the best available technology that may reduce the number or height of towers.

Policies

1. General Policies

- a. Encourage the placement of antennas on existing structures (including, but not limited to, existing towers, utility poles and electrical transmission towers, water tanks, building rooftops and other tall structures).
- b. Encourage, when appropriate, the upgrade or replacement of towers with facilities of equivalent height and designed to maximize co-location opportunities.
- c. New commercial wireless facilities up to 80 feet in height are the preferred telecommunication site alternative.
- d. Expedite the permitting of wireless communication towers that have minimal visual impacts and meet all regulatory standards.
- e. Maintain an inventory of tower sites and all existing telecommunication facilities. This information shall be used to determine co-location opportunities.
- f. Coordinate with adjoining localities when a tower request is proposed near the County boundaries.
- g. Encourage future providers to provide their “build out” coverage grid for the entire County.
- h. Obtain industry and citizen input in the future development of local wireless communications regulations.

2. Siting Policies

- a. The most preferred areas for personal wireless service facilities are those that have concentrations of employment and mature tree stands; the least preferred areas are in existing residential areas, historic/archeological site and natural resource areas.
- b. The most preferred siting for personal wireless facilities are on or within existing

structures where the facilities would not be highly visible and within trees with only the antenna arrays above the tree tops; the least preferred sitings are in open fields or areas, or on highly visible rooftops.

- c. Towers in areas zoned or planned for residential uses are strongly discouraged.
- d. Non-stealth towers adjacent to or in close proximity to existing or planned residential uses are discouraged.
- e. New towers should be considered only when co-location or replacement of existing towers is not feasible.
- f. County-owned, state-owned or federal properties and facilities should be considered to encourage proper siting of wireless communications towers provided:
 - The use and character of public properties and adjacent properties are not adversely impacted;
 - The proposed telecommunications facilities are consistent with other elements of the land use plan and the zoning ordinance; and
 - Appropriate approvals and agreements are reached with the public agencies, boards or authorities.
- g. If co-location opportunities are not possible, siting of towers should be encouraged at locations within wooded areas or remote sites away from residential structures. While such locations may not obscure from view the entirety of the tower, they may reduce the visual impact.
- h. Towers should be located on a down-slope, with no portion of the tower extending above the mountain ridgeline upon which it is located.
- i. New towers or antenna structures shall not block the County's microwave paths or interfere with the County's public safety radio system.
- j. No tower shall be located within 1,000 feet of Virginia Scenic By-Ways unless an acceptable stealth tower design is utilized.

3. Design Policies

- a. The most preferred design for personal wireless facilities will be on the shortest possible mount with dual-polarization or omni-directional antennas; monopoles with triangular platforms are next in preference, while guyed towers and lattice towers are strongly discouraged.
- b. Camouflage tower designs should be considered for various applications.
- c. Limited clearing of the site is recommended. Existing mature vegetation should remain.
- d. Security fencing and visible tower locations should be screened from public view. A row of evergreen trees a minimum of 8 feet tall and a maximum of 10 feet apart planted around the perimeter of the fence and a continuous hedge at least 30 inches high in front of the tree line are recommended.
- e. Lighting and painting, other than in neutral colors, of a tower are discouraged unless required by the Federal Aviation Administration. Towers should be constructed at reduced height to eliminate lighting requirements. However, when lighting is required it should be shielded and oriented inward so as to not project on surrounding properties.
- f. Earth tone colors for equipment shelters and towers are recommended.
- g. When antennas are attached to an existing building, they should be painted to blend with the existing structure.
- h. Access to the site should meet all requirements of the Department of Public Works.
- i. In highly visible or sensitive locations, antenna mounts should be flush mounted.
- j. FAA Feasibility or Aeronautical Study must be done by all applicants to ensure that any proposed structure does not interfere with airspace safety.
- k. Propagating studies must be done by all applications of proposed facilities to show area of coverage.

■ EXISTING TOWER SITE SUMMARY

The summary presented in Table 9.10 lists the existing and approved antenna sites throughout Fauquier County and several miles across the county border into adjoining counties. Sites in neighboring counties are shown because of their potential to provide coverage along the borders and into Fauquier County. Sites in the referenced table are also identified by Case Number, Structure Owner, Location, Tower

Height, Latitude/Longitude Coordinates, and the amount of serviceable co-location positions (Slots) available. Sites identified by a single asterisk are either under construction or are scheduled to be constructed within the year (2000). Each site can be found on the map presented in [Map 9.7](#). (Note that Table 9.10 and Map 9.7 are updated periodically. Current information on existing commercial wireless facilities and towers is maintained in the Department of Community Development, and is available for public review or duplication upon request.)

Only those structures where co-location is feasible are identified on the list. Structures that are not capable of supporting additional equipment are not included. Additionally, structures that may have available slots, but are not available for commercial applications, such as military structures, were also excluded from the list. Water towers are included and it is noted that they may have capacity to hold between one to three carriers, depending on structure design, elevation and associated factors.

■ PERMITTED COMMERCIAL TOWER DEVELOPMENT

A significant infrastructure of towers, water tanks and other structures capable of supporting wireless communication equipment is in place throughout Fauquier County and adjoining counties. Many of these structures are currently being utilized to mount antennas, microwave dishes, paging whips and other ancillary equipment that compose wireless communication systems. Practically any above ground structure provides an opportunity for mounting equipment. Structures such as rooftops, water tanks, grain silos and church steeples are often used to mount antenna arrays.

A total of 42 structures capable of supporting wireless communication equipment exist throughout the county and several miles beyond its border (Refer to Table 9.10). Propagation studies were performed on each structure to determine coverage areas (see [Figure 9.8](#)). The analysis revealed that adequate coverage is available, through the utilization of existing structures, over approximately 70% of the county. In these areas of adequate coverage, a wireless communication carrier in the future may need additional capacity. If such capacity is required through a new structure location, then it is recommended that a Mini/Micro Cell, which is a structure typically less than 80 feet in height, be used to provide the added coverage.

In the residual areas where coverage does not exist, commercial wireless facilities are permissible by right up to a height of 80 feet, and subject to design, height, sitting and location criteria established in this plan and the Fauquier County Zoning Ordinance.

Any structure proposed for construction within the Route 50 corridor is recommended for restriction to a maximum height of 80' which would allow coverage to be provided in this heavily traveled corridor yet

remain relatively obscure visually if sited in wooded areas. Coordination with Loudoun County for any such proposal is required.

In sum, the development of commercial wireless facilities, subject to plan guidelines, will afford carriers the opportunity to create carefully considered networks throughout the entire county. The network will include a combination of existing and future facilities in conjunction with new technologies. As this technology matures, the County's telecommunication plan will assist the Planning Commission and Board of Supervisors in efforts to:

- Assure new facilities conform with zoning requirements;
- Provide opportunities to minimize visual impacts through natural screening;
- Avoid byways, airports, air facilities and historic areas; and
- Identify the best locations, for structure development in terms of topography,
- Interference and coverage which use the best available technology that may reduce the number or height of towers.

■ IMPLEMENTATION RECOMMENDATIONS

Visibility Guidelines

Plan principles for Commercial Wireless Tower Facilities encourage and provide for the camouflage and concealment of proposed telecommunication towers. The following are general guidelines designed to reduce the visual impacts within the vicinity of proposed commercial wireless and tower facilities.

As indicated in the policy section, for example, any new towers constructed in the county shall not be located along ridge lines, but downslope from the top of ridge lines to preserve views of the local mountain ranges. Visual impact can be further minimized, particularly in the instance of an 80 foot monopole, by screening the structure in preserved woodland, which has a minimum radius depth of 100 feet. (Refer to [Figure 9.3](#))

In the instance of a rural/agricultural setting, an option for the concealment of towers can be found in either the employment of existing or new silos where deemed compatible with onsite buildings and adjoining properties. While unsightly in areas out of context with this type of application, silos provide the opportunity to blend the best of rural landscape tradition with modern technology without sacrificing the option for aesthetic continuity, including conservation of valued view sheds and historic, rural or agricultural architectural consistency with the community area.

This type of camouflage option, as reflected in the attached Figure 9.4, is accomplished by introducing form and material types familiar to the rural setting, while accommodating tower design criteria and county goals. Additionally, the structure lends itself to being an advantageous solution because of its capacity to house simultaneously both tower and related telecommunication equipment. For example, the silo option would eliminate the need for an additional equipment hut which is typically constructed outside and within a fenced and secured area adjacent to most tower installations. These structures should range between 60 to 120 feet in height, depending on the height of the associated agricultural buildings and structures. For example, a newly constructed telecommunication silo should maintain a height compatible with surrounding structures in order to maintain a balanced sense of proportion and scale with the existing environment (2 to 3 feet of silo height per each foot of building height).

■ CAMOUFLAGE SCREENING USING EXISTING OR NEW STRUCTURES EMPLOYING A 2:1 AND 3:1 RATIO [FIGURE 9.4](#)

Comprehensive Plan Compliance

Proposed commercial wireless facility special exception applications in Fauquier County are required to proceed through Planning Commission “Virginia Code 15.2- 2232 Review” for conformity to the adopted Comprehensive Plan as a public utility. That requirement needs to be stated within the Zoning Ordinance, and it is recommended further that this requirement not apply under the following circumstances:

- To antennas placed on or within existing silos, attached to existing towers, water tanks and similar structures; or
- To telecommunication tower facilities proposed for construction at 80 feet in height or less.

Special Management Areas

All applications that involve locations designated as scenic byways, wildlife management areas, and/or historic places are to be reviewed by members of the Architectural Review Board as part of the overall process.

Maps 9.8 to 9.16 identify federal, state, and county parks, as well as wildlife management areas located in Fauquier County. Existing zoning requirements discourage telecommunication facilities from locating closer than 5,000 feet from the designated areas, except within existing silos and towers. The principal reason for this protection zone is that these areas are considered important for their environmental resources, recreational opportunities, vistas and associated activities valued by local and regional residents and representing an important element to the County’s tourism industry.

Map 9.8 Sky Meadows State Park	Map 9.9 G. Richard Thompson WMA
Map 9.10 Chester Phelps WMA	Map 9.11 Bull Run Mountain
Map 9.12 Whitney State Forest	Map 9.13 Lake Brittle
Map 9.14 Weston Refuge	Map 9.15 Quantico
Map 9.16 A County Parks	Map 9.16 B County Parks
Map 9.16 C County Parks	Map 9.16 D County Parks
Map 9.16 E County Parks	Map 9.16 F County Parks
Map 9.16 G County Parks	

Commercial Wireless Facility Height Limitations

The existing Zoning Ordinance provisions allow tower facilities up to 80 feet in height as a by right use in any Zoning District Classification. In areas with forest stands in excess of 70 feet in height, it is recommended that this height standard be refined to allow new or existing telecommunication towers to be constructed or expanded to extend ten feet above the established treeline by-right.

Special Resources

Recommend that the County:

- Periodically update its GIS mapping to identify road additions to the designated Virginia Scenic Byways in Fauquier County (refer to [Map 9.17](#)).
- Complete a comprehensive inventory of historic and archeological significance.

Fauquier County has a rich heritage represented by historic homes, farms businesses, places of worship, transportation corridors and landscapes standing much as they did over two hundred years ago. These irreplaceable pieces of our county, state and national heritage are threatened by age, neglect and a variety of land development pressures. These resource inventories will assist the Architectural Review Board, Planning Commission and the Board of Supervisors in their review and decision responsibilities regarding telecommunication facility and other land development application proposals.

Every attempt should be made to avoid location of commercial wireless facilities in close proximity to these historical and cultural resources, as well as the previously referenced parks, scenic and wildlife managed areas.

Recommended Process for New Commercial Wireless Facilities

The following process is recommended to serve as a guide for the collocating of communication facilities on structures and to provide the successful completion of the planning, review, and construction of commercial communication equipment:

- a. Carriers locate existing towers or structures within the coverage area.
- b. Carriers contact owner and management company that has authority over the said structure.
- c. Carriers provide owner with co-location information and an analysis of radio frequencies, intermode, structural analysis, and propagation studies.
- d. Upon satisfactory completion of said agreement between owner and co-locator; co-locator must provide the County Department of Community Development with an Application for Wireless Communication Site and other related information concerning the communication facility.

The County will review the application and, based upon the screening and approval process guidelines, forward the approved application with construction drawings stamped by a registered professional engineer before a building and zoning permit shall be issued.

- e. All drawings and specifications shall comply with local, state, and federal regulations.
- f. If co-location is not possible, all structural analysis, radio interference studies, and propagation analysis shall be forwarded to the Department of Community Development for review. The carriers may be required to change antenna arrays and other technical applications to have successful co-location.
- g. If co-location is not possible as agreed to by the County of Fauquier, the Applicant may request:
 - New tower construction up to 80 feet AGL (Above Ground Level) by right through the site plan process;
 - New tower construction greater than 80 feet AGL must proceed through the required special exception and comprehensive plan compliance process.

- It is recommended that the Zoning Ordinance section regarding commercial wireless facilities be revised to state that the telecommunication special exception approval becomes null and void if construction does not commence within one-year of the Board of Supervisors approval date.

Special Study Requirements

It is recommended that the Zoning Ordinance provisions regarding commercial wireless applications include the:

- FAA study as part of the initial application submission requirements. This requirement is due to the preponderance of airports, airfields, and landing strips located within the County. A FAA Study is needed to insure that any potential hazard to air navigation has been minimized.
- By obtaining an Airspace Safety Analysis from the Applicant, time consuming processes will be eliminated and afford the County the opportunity to respond to an application in a more timely and efficient manner; and a
- Structural analysis from the tower manufacturer stating the load-bearing capability of the tower being submitted in the application process. This requirement will provide unequivocal evidence as to the capability of a specific structure to support multiple antennae equipment.
- All commercial wireless communication special exception application submissions must be referred to the Airport Consultant, or the responsible and designated County agency, for review and recommendations regarding impacts on the Warrenton/Fauquier Airport and its expansion plans.

Fall Zone

It is recommended that the fall zone for commercial wireless facilities proposed for construction shall be one (1) foot in setback for each foot in structure height from the nearest property line. This standard shall apply in all Zoning Districts.

Location Requirements

- Parks & Wildlife Management Areas. One of the existing Zoning Ordinance requirements limits the location of commercial wireless facilities from locating within 5,000 feet of a federal, state or county park or wildlife management area.

- Some flexibility to this standard needs to be considered. It is recommended that commercial wireless facilities be allowed by-right on existing structures or within existing silos. Note that all communication infrastructure and electronics associated with a carrier's antenna array must be located within the silo.
- Setbacks from Residential Units. Recommend that a commercial wireless carrier with a proposed antenna array, electronics and associated infrastructure included entirely within an existing silo, 80 feet or less in height, be allowed within 300 feet of an adjoining property's residential unit. The current ordinance requires a 1,000 foot setback for any new proposed wireless facility; it does not consider the camouflaged alternative.

Balloon Tests & Other Requirements

It is recommended by policy that all telecommunication special exception applications be subject, at a minimum, to balloon tests which must meet the following general guidelines:

- Must be conducted on a Friday or Saturday;
- The red balloon, or alternate display method (e.g., crane), must be displayed over a 24 hour period;
- Should be scheduled and conducted prior to the Planning Commission public hearing;
- The Applicant must identify the date for the proposed test, including a rain date, and provide that notification to the Board of Supervisors, Planning Commission, adjacent Homeowners Associations and property owners, and the Department of Community Development;
- Require the tether from the balloon to the ground connection for the site location be marked in red, orange or other highly visible color; and
- Require the Applicant to provide pictures of the balloon test from four strategic locations.

Other Equipment

The Zoning Ordinance needs to address commercial satellite and microwave dishes regarding their placement on a tower or other building structures. It is recommended that satellite and microwave dishes six (6) feet or greater in diameter are not permitted on either towers or buildings. A structural analysis on all proposed tower mounted satellite and microwave dishes shall accompany their application. The reason for this analysis is due to special wind and ice loading considerations. All dishes are to be of a neutral

color and non-reflective finish and contain no advertising or other conspicuous markings. Ground-mounted, non-commercial satellite and microwave dishes are exempted from these requirements.

NEPA Site Evaluations

As part of the application process, it is recommended that applicants submitting for new tower (structure) sites should be required to conduct a National Environmental Policy Act (NEPA) Site Evaluation. This act requires federal agencies to consider environmental values and factors in agency planning and decision-making.

A NEPA Site Evaluation is a standard process to identify wilderness areas, wildlife preserves, endangered species, historic places, Indian religious sites, floodplain areas, and other surface features of significance within the designated search area. Based upon the findings, the County may require an avoidance or mitigation plan be developed prior to site approval. Additionally, all applicable federal, state and local permits would need to be obtained prior to approval as the result of any potential adverse impacts.

■ TABLE 9.10: STRUCTURES AVAILABLE FOR CO-LOCATION

ATC Case #	Owner	Location	Height	Lat.	Long.	Slots
Fauq.-1002	Bell Atlantic Mobile Systems	Silver Hill Road	190'	38-28-18 N	77-41-53 W	4
Fauq.-1004	Lois Volunteer Fire Dept.	Lois	70'	38-32-17 N	77-43-47 W	4
Fauq.-1007	Fauquier Co. Water & Sanitation Authority	Remington	160'	38-32-59 N	77-48-08 W	1-3*
Fauq.-1009	CWS	New Baltimore	199'	38-46-01 N	77-42-13 W	1
Fauq.-1013	Town of Warrenton Water Tower	Warrenton	180'	38-42-48 N	77-47-35 W	1-3*
Fauq.-1014	Va. Dept. of Agriculture/Consumer Service	Warrenton	220'	38-42-44 N	77-48-24 W	3
Fauq.-1016	N&W/CSX RR	Calverton	210'	38-37-45 N	77-40-34 W	3
Fauq.-1017	Bell Atlantic Mobile Systems	Marshall	300'	38-52-04 N	77-49-42 W	3
Fauq.-1018	Cellular One	Marshall	180'	38-51-57 N	77-49-53 W	2
Fauq.-1019	Unknown	Blue Mountain	220'	38-57-09 N	78-01-43 W	1
Fauq.-1020	Unknown	Blue Mountain	180'	38-57-09 N	78-01-43 W	1
Fauq.-1021	Unknown	Blue Mountain	125'	38-57-09 N	78-01-43 W	1
Fauq.-1022	AT&T	Blue Mountain	110'	38-57-19 N	78-01-35 W	1
Fauq.-1023	Alleghany Power	Blue Mountain	90'	38-57-22 N	78-01-30 W	1
Fauq.-1024	Unknown	Blue Mountain	140'	38-57-22 N	78-01-30 W	1
Fauq.-1025	Unknown	Blue Mountain	135'	38-57-22 N	78-01-30 W	1
Fauq.-1026	CNS Microwave	Blue Mountain	85'	38-57-22 N	78-01-30 W	1
Fauq.-1027	Unknown	Blue Mountain	130'	38-57-28 N	78-01-28 W	1
Fauq.-1028	Unknown	Blue Mountain	155'	38-57-28 N	78-01-28 W	1
Fauq.-1029	SBA	Bull Run Mountain	210'	38-54-24 N	77-40-20 W	1
Fauq.-1030	Unknown	Bull Run Mountain	220'	38-54-24 N	77-40-20 W	1
Fauq.-1031	Unknown	Bull Run Mountain	200'	38-54-24 N	77-40-20 W	1
Fauq.-1032	Unknown	Bull Run Mountain	70'	38-54-24 N	77-40-20 W	1
Fauq.-1033	Unknown	Bull Run Mountain	70'	38-54-24 N	77-40-20 W	1
Fauq.-1034	Unknown	Bull Run Mountain	70'	38-54-24 N	77-40-20 W	1
Rapp.-1035	Cable TV	Mt. Marshall	180'	38-51-05 N	78-08-41 W	2
Rapp.-1036	AT&T	Mt. Marshall	120'	38-51-00 N	78-08-53 W	1
Fauq.-1037	AT&T	Summerduck	140'	38-28-48 N	77-44-59 W	1
Fauq.-1038	Sprint	Airlie	150'	38-46-35 N	77-48-54 W	3
Fauq.-1039	National Communications Tower*	Opal	147'	38-37-05 N	77-48-30 W	3
Staf.-1040	National Communications Tower*	Hartwood	199'	38-24-11 N	77-34-36 W	4
Fauq.-1041	American Tower Corporation	Ensors Shop	140'	38-31-52 N	77-39-10 W	1
Fauq.-1042	National Communications Tower*	Bealeton	199'	38-33-43 N	77-45-41 W	5
Fauq.-1050	Fauquier Co. Water & Sanitation Authority	The Plains	80'	38-51-40 N	77-46-30 W	1-3*
Fauq.-1051	Fauquier Co. Water & Sanitation Authority	Turnbull	80'	38-40-04 N	77-51-34 W	1-3*
Fauq.-1054	Fauquier Co. Water & Sanitation Authority	Catlett	170'	38-39-32 N	77-38-36 W	1-3*
Fauq.-1056	Marshall Water Works	Marshall	80'	38-51-58 N	77-51-17 W	1
Fauq.-1057	Vint Hill Water Tanks	Vint Hill Farms Station	80'	38-44-58 N	77-40-28 W	1
Fauq.-1060	Vint Hill Farms (Two-way Comm. Tower)	Vint Hill	100'	38-44-46 N	77-40-47 W	8
PrVm.-1061	AT&T	Vint Hill	180'	38-44-11 N	77-35-07 W	2
Culp.-2017	SBA	Elkwood	260'	38-30-58 N	77-48-52 W	3
Culp.-2204	Sprint*	Waterloo	250'	38-40-46 N	77-54-47 W	3

■ EXHIBIT A: COMMERCIAL WIRELESS COMMUNICATIONS GLOSSARY OF TERMS

AGL – Above Ground Level – the height above ground as measured from the ground to the top of the structure.

AMSL – Average Mean Above Sea Level – equal to the sum of the AGL and GE.

BTA – Broadcast Transmission Area.

CDMA – Code Division Multiple Access (see review of Wireless Technologies).

Co-location – The sharing of space on a structure to support multiple carriers.

FAA – Federal Aviation Administration.

FCC – Federal Communication Commission.

GE – Ground Elevation.

GSM – Global System Mobile Communication (see review of Wireless Technology).

Guyed Lattice Tower – Lattice tower that is supported by wire cables.

LEC – Loop Exchange Carrier – a communications company licensed to provide local exchange service for telephony service providers.

Mini/Micro Cell – Small structure, typically less than 80' AGL, used to fill “gaps” in coverage.

Monopole – Cylindrical structure, erected vertically, used to mount antennae.

MSA – Mobile Service Area.

MTA – Mobile Transmission Area.

MW – Microwave – digital service licensed by the FCC for transmission and receipt of compressed voice data. Microwave systems are used to transmit large amounts of data, from point to point, over greater distances than traditional broadcast systems.

Paging – Wireless transmission of data designed for messaging services. Paging technology has evolved from receive-only radio tones to the transmission and receipt of alphanumeric messages.

Propagation – The physical principle of the energy emitted through broadcasting a frequency as it relates to transmission, power, ASML, antenna gain and transport loss.

PCS – Personal Communication Services (see review of Wireless Technologies).

PCTDA – Permitted Commercial Tower Development Area.

RSA – Regional Service Area.

Rx – Receiver – a wireless radio device that receives a broadcast from a transmission device allowing the broadcast circuit to be completed.

Self – Supporting Structure – Either a monopole or lattice design tower that is free-standing and requires no additional support.

SMR – Specialized Mobile Radio – two-way paging system used to transmit and receive. SMR systems

designate a specific narrow band channel to broadcast and receive, thus creating a “secure” communication channel.

TDMA – Time Division Multiple Access (see review of Wireless Technology).

Topographic Study – How the terrain and other land forms and natural features impact the transmission and receipt of radio waves.

Tx – Transmitter - a wireless radio device that broadcasts a signal to be received by a specific receiver device.

Wireless Internet – The provision of internet services through specialized devices over a wireless network.

■ EXHIBIT B: SUMMARY OF WIRELESS TECHNOLOGIES

Cellular- Refers to communications systems, especially the Advanced Mobile Phone Service (AMPS), that divide a geographic region into sections, called cells. The purpose of this division is to make the most out of a limited number of transmission frequencies. Each connection, or conversation, requires its own dedicated frequency, and the total number of available frequencies is about 1,000. To support more than 1,000 simultaneous conversations, cellular systems allocate a set number of frequencies for each cell. Two cells can use the same frequency for different conversations so long as the cells are not adjacent to each other. The two other analog systems in operation in the United States are Extended Advanced Mobile Phone System (EAMPS) that has currently replaced AMPS as the US standard. Narrowband AMPS is the third and existing cellular system in operation in the US. It has three times as many voice channels as EAMPS with no loss of signal quality.

All three systems have forty-two (42) control channels that are for setting up calls; the remaining channels are for voice conversations. All three systems are also analog systems. The systems are listed in chronological order and are backward compatible; that is, the infrastructure is designed so that older phones work on the newer systems.

PCS- Short for Personal Communications Service, the U.S. Federal Communications Commission (FCC) term used to describe a set of digital cellular technologies being deployed in the United States. Personal Communications System (PCS) includes Code Division Multiple Access (CDMA), Global System Mobile Communication (GSM), and North American Time Division Multiple Access (TDMA), also called IS-136). Two of the most distinguishing features of PCS systems are that they operate at the 1900 MHz frequency range and that they are completely digital.

CDMA- Short for Code Division Multiple Access, a digital cellular technology that uses spread-spectrum techniques. Unlike competing systems, such as GSM, that use time-division multiplexing (TDM), CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with pseudo-random digital sequence.

CDMA is a military technology first used during World War II by the English allies to foil attempts at jamming transmissions. The allies decided to transmit over several frequencies, instead of one, making it difficult for the Germans to pick up the complete signal. Because Qualcomm Inc. created communications chips for CDMA technology, it was privy to the classified information. Once the information became public, Qualcomm claimed patents on the technology and became the first to commercialize it.

TDMA- Short for Time Division Multiple Access, a technology for delivering digital wireless service using time-division multiplexing (TDM). TDMA works by dividing a radio frequency into time slots and then allocating slots to multiple calls. In a way, a single frequency can support multiple, simultaneous data channels. TDMA is used by the GSM digital cellular system.

GSM- Short for Global System Mobile Communications, one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency. GSM was first introduced in 1991 and is available in over 100 countries and has become the de facto standard in Europe and Asia.

SMR- Short for Specialized Mobile Radio-Two-Way and thus used to transmit and receive. These technology takes basics two-way radio and designates a specific Narrowband channel to broadcast and receive, thus creating a “secure” channel for communication.

MW- Short for Microwave, this is a medium of communication licensed by the Federal Communications Commission as services used for the transmission and reception of compressed voice and data. These systems typically are direct point-to-point transmissions that large amounts of information may be sent over longer distance verses a short broadcast. This technology typically is in digital form.

Paging- Wireless medium of communication via the transmission of data for messaging service. This technology has evolved from single radio tones to two-way transmit and receive messaging.

Internet- The electronic medium by which information may be uploaded or downloaded to a degree in which it may be reviewed, manipulated and used for recreational and commercial applications. This technology is typically sent via a wire Local Exchange Carrier (LEC) network. However, the technology is available for the deployment of a wireless network.